

1885.

ILLUSTRATED PAMPHLET

OF

The Iron Substructure Co.,

COLUMBUS, OHIO.

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1885

WILLIAM L. LAMSON
COLUMBUS UNIVERSITY

OFFICERS FOR 1885.

HYLAS SABINE, President.

S. G. HUTCHINSON, Secretary.

GEN. PHINEAS PEASE,

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MICHAEL HATTEN,

B. R. ABBOTT,

GEN. A. J. WARNER.

CAST IRON BRIDGE PILES.

THIS improvement consists of a cast iron pile, and is composed of three parts; viz., the pile proper, the iron cap which goes over the upper portion, and the iron plate that bears upon the earth as a support to the pile.

The pile has a socket at the top, and a solid point at the lower end. The cap of the pile has a plate, on which the beam of the bridge rests, and to which it is fastened by bolts. The piles are readily driven, easily secured in position and braced.

The several features and the use of the pile are shown in the cuts.

The serviceable, and therefore the desirable elements of a bridge, are those of strength and durability. Large iron bridges, with their stone abutments, are costly and entail heavy taxation. On the other hand, the cheap wooden bridges as ordinarily built, with wooden pile supports, are found to be inadequate and troublesome, being subject to frequent repairs, proppings, "wash-outs," and of short duration. Yet, cheap as these latter structures may seem, they are more expensive than is generally supposed.

This early decay, together with the known liability to "wash-outs," and the additional expense incurred for repairs, make the bridge an expensive item in the tax lists and a source of annoyance besides.

The public need is met in a properly constructed bridge, furnished with the Gray-Abbott pile for a substructure. There is economy and service in the construction of such a bridge.

The speedy decay of the wooden pile bridge is a serious and insuperable objection. As a consequence of this decay and impairment, an unsafe condition of the bridge ensues for at least a portion of the time. The trading and travelling public are

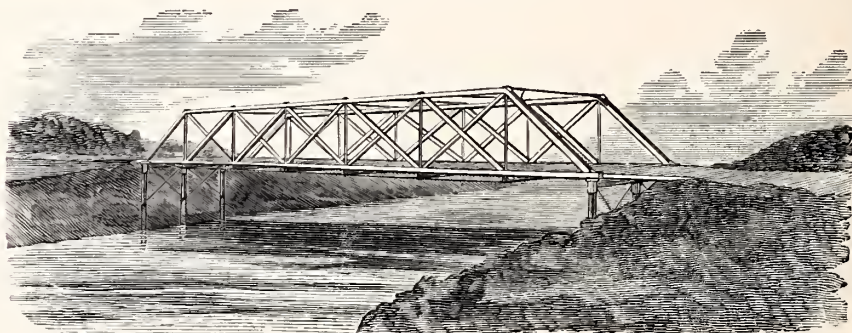
thus exposed to danger—the risk of property and of life itself.

It will be observed that while the wooden pile is a splendid conductor of dampness, that produces premature decay, iron piling, on the contrary, is a splendid *non-conductor*. The practical effect of using iron piles is to *prolong* the life of the bridge.

The sound portion of the superstructure of a wooden bridge standing upon wooden piles, in toppling condition, cannot be utilized to any profitable extent in rebuilding the bridge.

This is known to all contractors.

Placing any considerable number of piles in the way of the current serves to catch the debris, and choke up the stream, producing overflow, back-water, and wash-outs.



HOWE TRUSS.

The best of oak piling is quite deficient in the requisite qualities of a substructure. Neither in crushing strength nor deflecting power is it all comparable with good iron casting.

The crushing strength of cast iron as compared with American white oak is about sixteen times. The iron will sustain a weight of some 100,000 pounds per square inch of section, and white oak about 6,000 pounds.

As to the ability of the cast iron pile to resist side or horizontal pressure from “floats” of various sorts, or from drift ice, the reader is referred to the deductions from the experiments of the United States Ordnance Department—Barlow, Rennie, Stephenson, Pasley, Hatfield, and Haswell. They found the value of cast iron to be about four times that of American white

oak for this purpose. Where there is great danger of drift ice, it may be guarded against by the employment of ice guards.

As a consequence of the superior strength and durability of the cast iron piling, long spans can be employed safely, which cannot be done with the treacherous wooden piles, thus avoiding the dangers and difficulties of drift and ice.

With respect to the durability of a cast iron pile, the opinion of Mr. Ira Merchant, City Engineer, is here given :

OFFICE OF CITY ENGINEER, }
BLOOMINGTON, ILL., December 28, 1882. }

To whom it may concern :

The question having arisen as to the durability of cast iron when buried in the ground or submerged in water : After twenty years' experience I am satisfied that it is practically indestructible. At the point of contact with the surface, I am of the opinion that a good coating of mineral paint would prevent the accumulation of rust, and the portion subject to atmospheric changes may be preserved for an indefinite time by the application of such paint.

IRA MERCHANT,
Civil Engineer.

Cast iron has been used in submerged situations, such as sewers, gas and water mains, for long periods of time without evincing damaging effects. The following explains itself :

MARYSVILLE, UNION Co., O., October 23, 1883.

This is to certify that I have examined the plans and specifications of an improved iron pile, patented by Gray & Abbott, and I believe they are eventually destined to come into general use for substructures for highway bridges. I can see no reason why they are not more durable than stone masonry, and are as certainly a great saving in the cost of substructures.

Respectfully,
FRED. J. SAGER,
Civil Engineer and Surveyor of Union Co.

This improvement concerns chiefly the economy and durability of substructures or foundational part of bridges, etc., and the Gray-Abbott pile is equally adapted to an *iron* or wooden bridge. The piles in most instances are preferable to stone. Stone is mostly employed where it abounds, and where there exists a rock line of shore or river bed. Otherwise, on account of transportation and needful excavations in soft or sandy ground, stone is reckoned too dear.

In this connection we introduce a letter from Col. R. B. Mason, who was chief engineer of the Illinois Central Railroad during its construction :

OFFICE CHICAGO SOUTH BRANCH DOCK COMPANY, }
ROOM 2, 40 DEARBORN ST., CHICAGO, February 25, 1884. }

B. R. Abbott, Agent Iron Pile and Bridge Co.:

DEAR SIR—I am in receipt of your favor of the 23d and your circular relative to cast iron piles. Your plan of bridges strikes me very favorably, and I think it a great improvement, in point of durability, over wooden piles, and in point of safety and economy, over stone piers and abutments. Stone piers and abutments, unless on pile foundations, are very liable to be undermined, and whether with or without piles, the foundations are very often a very large portion of the expense, which it is very difficult to determine before building. I think the time has come, and that it is true economy, to make our improvements more permanent than we have in the past, and it seems to me that you have struck a happy medium in point of expense, durability, and economy, that will tend to that result.

Very respectfully,
R. B. MASON,
President.

As to abutments, while they are a very common part, yet they are not a necessary part of a bridge. Since the introduction of iron supports the approaches are made with aprons. This method is recommended by some of the best bridge builders. At the present time the railway companies are adopting this plan in small pile bridges.

The convenient manner of erecting the Gray-Abbott pile, together with a brief description of the pile, is contained in the

following extract from the specifications of the patent, leaving out the numbers and letters, which are solely for reference to the patent drawings.

DESCRIPTION OF THE PILE.

“Our improved pile is composed of a central hollow cylinder, with its lower end solid and pointed. The cylinder is provided with four flanges, beveled or sharpened at their lower ends, and which preferably are extended down to the solid point. The upper portion of the hollow cylinder has an enlarged socket, over which loosely fits the hollow cylinder or cap of our improved pile. The upper portion of the cap is composed of an elongated flat plate, provided with side flanges for the reception of the superstructure or beams of the bridge, the said cap having wide ribs or flanges. The broad plate (iron) is preferably formed in two parts with flanges, having bolt holes by which it may be secured or clamped to the pile.

“When the plate is made in one piece, it has an opening adapted to the passage of the pile through it—is, in fact, slipped over the pointed end of the pile and secured in proper position.

“The objects of the flanges of the plate are two-fold: first, to strengthen them, and, secondly and more particularly, to provide convenient means for the braces or other desired fixtures.

“The manner of erecting the pile is as follows: A solid cylindrical piece of wood is fitted into the socket of the pile similarly to the handle of an ordinary chisel. This piece of wood or handle receives the blows of the hammer and protects the pile from injury precisely as the handle protects the chisel. After the pile is driven, the piece of wood or handle can be taken out and used to drive other piles. Now, as before stated, a pile can be only so driven as to approximate the desired height. In order to obviate this difficulty, we place a cylindrical block, sawed the proper length, and of a diameter to nearly fill the cylinder of the cap. The lower end of the cylindrical block of wood is made somewhat smaller, in order to rest within the socket in the pile. This block also forms a rest for the part or cap, and its length regulates the distance the cap can pass down or telescope over the pile, and consequently regulate

its height. The upper end of the cavity within the pile is plugged so as to prevent the ingress of water, or the cavity may be filled with concrete. In order to prevent the pile from settling into the earth under the weight of the superstructure, we preferably excavate the earth from around the pile after it has been driven for a greater or less distance, and then clamp or key the broad plate firmly to the pile, said plate resting upon the earth, and thereby forming a support for the pile. If the plate is made in one piece, the pile is driven through the suitable opening in the plate, and secured in position substantially as before described."

Cast iron supports for bridges have been used for many years, with most excellent results wherever they have been properly planted. The difficulty and expense of placing them in position alone has prevented their general introduction. The Gray-Abbott pile obviates these difficulties.

The piling was placed under an iron bridge in Arrowsmith Township, the work being done in the latter part of November, 1881, by Mr. Savidge, a copy of whose certificate is found below :

BLOOMINGTON, ILL., December 28, 1882.

To whom it may concern :

This will certify that I commenced the business of bridge building fifteen years ago, and have followed it constantly since. My experience has principally been in pile bridges. Last fall I placed Gray's iron piles under a bridge in Arrowsmith Township, McLean County. I had no difficulty in driving them. The hammer of my pile-driver weighs eleven hundred (1,100) pounds. I let it fall from a height of fourteen feet upon them. My opinion is that they are much more safe and economical than wooden piles. I recommend their use in the construction of bridges, believing it to be for the interest of the tax payer and the safety of the travelling public. My experience is that cast iron, when used as a bridge support, is not subject to decay.

JAMES N. SAVIDGE.

Since the date of his certificate Mr. Savidge has driven the piling under several bridges, and he speaks of the piling in terms more highly commendatory than ever.

The Arrowsmith Commissioners send the following certificate:

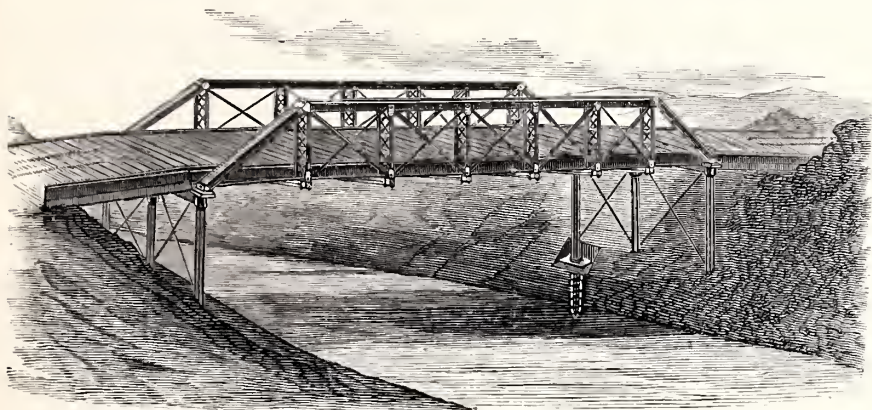
ARROWSMITH, ILL., September 2, 1882.

To whom it may concern:

We, the undersigned, Commissioners of Highways, heartily commend the Gray-Abbott piling. Having used them on one of our bridges, we find them firm and substantial.

Respectfully,

O. P. PAULDING,
WILLIAM SPENCER.



IRON BRIDGE.

The attention of township supervisors is particularly called to this improvement, as the adoption of the pile by highway authorities will relieve county boards of much embarrassment, seeing that but few towns would be obliged, if using this substructure, to ask for aid in building first class bridges. With this substructure you may have a good bridge without exceeding your tax limit, and encouraging extravagance on the part of some towns at the expense of others.

The subjoined paper will explain itself, and is submitted with the single remark that the supervisors who visited "The New Bridge" were *unanimous* in the endorsement of its merits:

We, the undersigned, members of the Board of Supervisors of McLean County, Ill., upon invitation having visited in a body the West Washington Street Bridge, two hundred feet in length,

over Sugar Creek, in said county, and built upon iron pile of the Gray & Abbott patent, have no hesitancy in saying that this pile, in the matter of economy and service, meets a long felt want and necessity in the use of something better than the wooden pile heretofore in use. The iron piles, in our opinion, make a durable and most desirable substructure for bridges.

SAMUEL B. KINSEY,	PETER WHITMER,	A. D. KIRKPATRICK,
V. E. HOWELL,	H. L. TREPENING,	J. WHITCOMB,
OWEN C. RUTLEDGE,	S. A. STOOPS,	JAS. THOMPSON,
T. B. KILGORE,	J. L. DOUGLAS,	D. J. OTTO,
OLIVER BEEBE,	HENRY CONGER,	JOSIAH BIGGS,
JOSEPH BAKER,	JAMES GILLAN,	GEORGE V. FRINK.

MARYSVILLE, UNION Co., O., September 8, 1884.

The cast iron piles used for substructure for the three span bridge across Mill Creek in this county have been a great saving in cost of bridge, and have so far proven to be very satisfactory.

URIAH CAHILL,
LUTHER LIGGETT,
NATHAN HOWARD,
Commissioners of Union Co.
F. J. SAGER,

County Surveyor and Civil Engineer.

OFFICE COMMISSIONER OF RAILROADS AND TELEGRAPHS, }
COLUMBUS, O., December 17, 1884. }

Gen. Phineas Pease, Columbus, O.:

MY DEAR SIR—In compliance with your request, I went out, when last in Marysville, to see a county bridge built upon your cast iron substructure.

This bridge is about a half mile from Marysville, and over Mill Creek. It consists of three spans, the intermediate supports of which are four eighteen foot cast iron columns. These piles, I understand, are driven eight feet into the earth, upon which are placed timber beams that support the bridge structure.

This bridge is remarkably solid in its bearing. The people of the county, as well as the County Commissioners and County Engineers, are all pleased with it. To me it seems the most economic method of bridge building, since the substructure will serve to bear many successive superstructures, and is in the

beginning a great deal cheaper than stone masonry, and not like it liable to be underwashed. It is a strong, durable, and cheap method of bridge substructure.

It is certainly the best means of substructure in the placing of bridges of public highways over railways.

It will, I think, be found to be the cheapest method of building overhead street bridges, and also, in my judgment, I believe it will be found of great economic value in the building of docks and piers. I am, sir, very truly yours,

H. SABINE,

Commissioner of Railroads and Telegraphs.

See page 15.

BLOOMINGTON, ILL., June 25, 1883.

Messrs. Abbott & Gray:

Having been invited to inspect the iron piles under a bridge across the Sangamon, near Arrowsmith, McLean County, I visited the place with other parties, and thoroughly inspected the piles. The superstructure was iron, about sixty feet in length, and I found the bridge as solid as if resting on stone abutments. ' Since then I have examined other bridges where this pile has been used, and where wooden superstructures have been adopted. This pile is easily driven to any depth, and I consider it practically indestructible. They may be used for any and all kinds of superstructures, and I am satisfied that you gentlemen have not considered all the possibilities or advantages of the pile. I am satisfied that in all ordinary cases the iron support below is preferable to the support from above as in iron bridges now in use. And as with this pile the two can be combined, it becomes evident that there is additional strength and durability.

Respectfully yours,

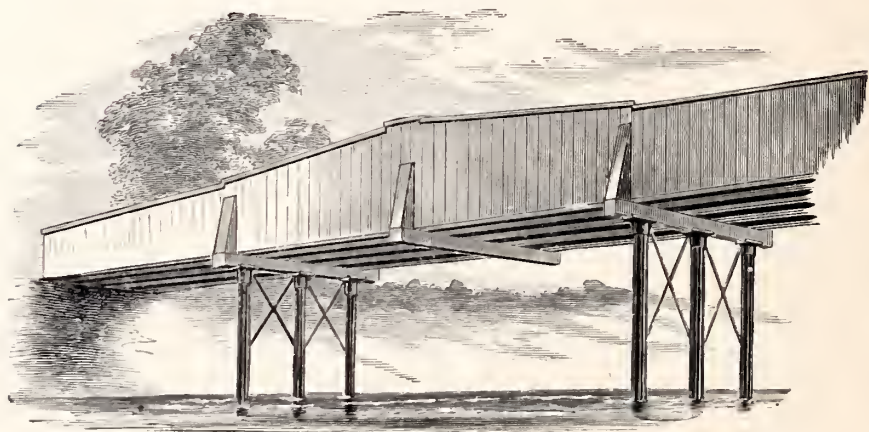
IRA MERCHANT,

Civil Engineer.

The Dale Township Commissioners certify to the great satisfaction their Gray-Abbott pile bridge affords them, and heartily commend the pile to others. This bridge rests upon twelve piles, fifteen feet in length.

Of the Dale Bridge the *Daily Leader* says :

"Messrs. Abbott & Gray have just completed a bridge in Dale Township, using their patent iron piling for the substructure. It was estimated that it would cost \$1,700 to build stone abutments for this bridge, leaving the superstructure still to be provided, while the entire cost of the bridge with the iron piling was a little less than \$1,100. With such facts existing these gentlemen cannot have much difficulty in introducing their iron piling."



PILE UNDER BRIDGE—PARTIAL VIEW OF DALE BRIDGE.

Attention is now directed to the marked difference between a wooden bridge upon *wooden* piles, and a wooden bridge upon *iron* piles. The former, as ordinarily put up, will last but ten years, meanwhile undergoing repairs. The reasons for the short life period are two-fold: first, the decay superinduced by the use of wooden piles in damp earth and in the water, and the effect of that on the bridge; and, secondly, the careless manner in which such bridges are usually erected. As the wooden piles are of such short duration, the commissioners do not feel justified in placing a good bridge upon them. But when it comes to the construction of a wooden bridge upon *iron* piles, that is quite another matter. Here you have a *permanent* support, and can *afford* to erect a good structure and protect it from weather exposure. A bridge of this class will last *thirty years*, deck or

road bed excepted, and the iron supports a hundred years or more.

Wooden piles and stone piers are subject to undermining and washouts. With the iron pile you can penetrate to a greater depth than with a wooden pile, and hence secure a *surer staying place*.

To lift a wooden bridge from a condition in which it lasts only eight or ten years to a condition in which it shall last twenty or more years beyond that period is no small consideration. Even if the first cost of the one is double that of the other, if it lasts three times as long, you have saved one bridge by the transaction, besides having the iron piling left to receive a new bridge.

The *Daily Independent* of June 15, 1883, says: "Yesterday we had occasion to examine the 200-foot bridge just completed by the Commissioner of Highways of Bloomington Township over Sugar Creek on West Washington street, and as it was the first opportunity we have had to see the Gray-Abbott iron bridge pile in actual use, and feeling as we do an interest in Bloomington inventions, we must say that we had no adequate idea before of the great benefit the inventors have given the public in the way of substructures for common highway bridges. When we take into consideration the large number of bridges that have to be maintained in the State, and the great cost of the old system of foundations, any invention which promises durability, strength and cheapness becomes a very important matter, not only to bridge builders, but especially to the general tax-payers. The bridge over Sugar Creek is over 200 feet in length, and yet its cost, when compared with a bridge erected upon stone pillars, and its durability, when compared to wooden piling, render it exceedingly cheap. Its advantages are so apparent that it only needs an examination to convince anybody that as a substructure for bridges this new invention is the best that has yet been placed before the public. A number of practical bridge men have examined this bridge, and all unite in commending it as the very thing needed. Its peculiar advantages are strength, durability, cheapness, and the ease with which the foundation is placed. It does away entirely with all excavations, leaves water courses unobstructed, and will outlast a half dozen wooden pile foundations. Bridge builders, Commissioners of Highways and all tax-payers who are interested in the erection and maintenance of bridges ought to give this new invention practical attention."

BRIDGES.

Attention is called to the following facts, viz.: A bridge consists of three parts; first, the substructure or foundation part; second, the suspension or deck supporting part; and third, the deck or floor itself. These several parts are frequently made of different materials. Ordinarily, what is known as an iron bridge has a stone foundation, iron suspension and wooden deck. Others again have all parts of wood. In nearly all cases the deck or floor system is of wood, which necessarily wears out and is subject to repair and renewal. The foundation and suspension parts should be made permanent and in such manner as will admit of repair and renewal of the deck without disturbing or endangering either of the former. To this end the Iron Pile and Bridge Company have perfected plans for highway bridges which embody an independent floor system; in other words, we build our bridges in such a manner that a part or the entire floor system may be removed for purposes of renewal or repairs without disturbing or endangering the other parts of the bridge.

It will be noticed that the most expensive parts of the bridge are protected, and thus rendered secure and permanent.

The attention of railroad companies is directed to the character of the gentlemen who have freely given their testimonials and opinions of the Cast Iron Pile for railway purposes. They have left but little to be said to the intelligent Engineer.

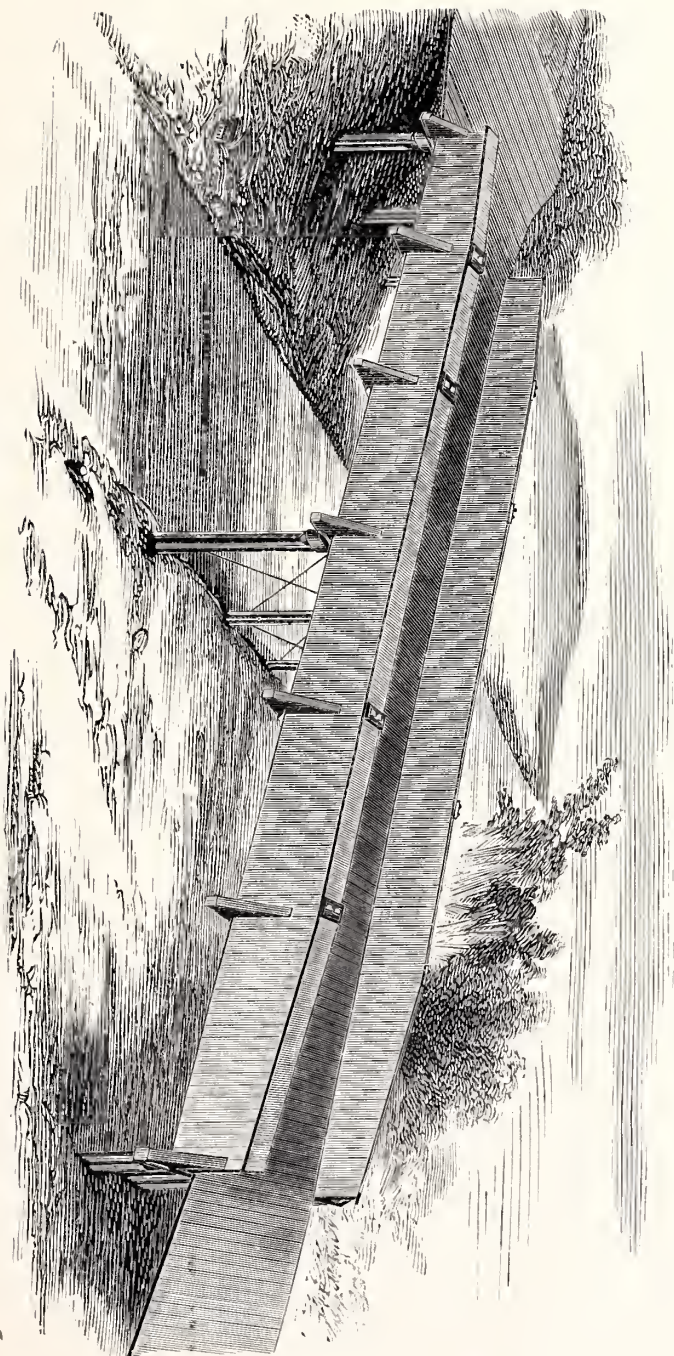
For docks, the cast iron pile, by reason of the facility with which it can be driven and its permanent character, secure from cutting ice and the ravages of marine worms, is the thing *par excellence*.

OFFICE OHIO CENTRAL RAILROAD Co., }
COLUMBUS, O., October 5, 1883. }

To whom it may concern :

This is to certify that I take pleasure in stating that I have examined the specifications of the Gray-Abbott Patent Cast Iron Piling, for superstructure for bridges, trestles and similar purposes in the construction of railways and highways, and am of the opinion that it is a good and economical substitute for stone

WASHINGTON STREET BRIDGE, BLOOMINGTON, ILL.



abutments, and piers where stone cannot be conveniently furnished, and much better than timber trestle and piling.

S. M. SEYMOUR,
Chief Engineer of Construction.

ARCHITECT
COLUMBUS, O.

CITY ENGINEER'S OFFICE,
COLUMBUS, O., November 10, 1883. }

To whom it may concern :

Having examined the specifications of the Gray-Abbott cast iron pile for bridges, and without personal or practical test of the pile for the purpose designed, am of the opinion that it will prove to be a valuable and useful invention for substructures for highway bridges, especially in locations where stone of a suitable quality are not at hand.

Respectfully,

JOHN GRAHAM,
Chief Engineer.

OHIO CENTRAL R. R., OFFICE CHIEF ENG'R, }
TOLEDO, O., December 19, 1883. }

Gen. P. Pease, Columbus, O.,

DEAR SIR — I have examined the circular of the Gray-Abbott cast iron pile and am very much pleased with it. The first thing that impresses itself on my mind is the adaptability of carrying highways over railways. These crossings are always a great annoyance, owing to the instability of the foundations as they are generally built. For open culverts and small girder bridges, I am satisfied they are the thing, and can be used during construction, thus making the permanent structure at once and avoiding the annoyance caused by the temporary timber culverts by their ever changeful and varying situation, caused by the rough usage to which they are subject by construction trains.

Yours respectfully,

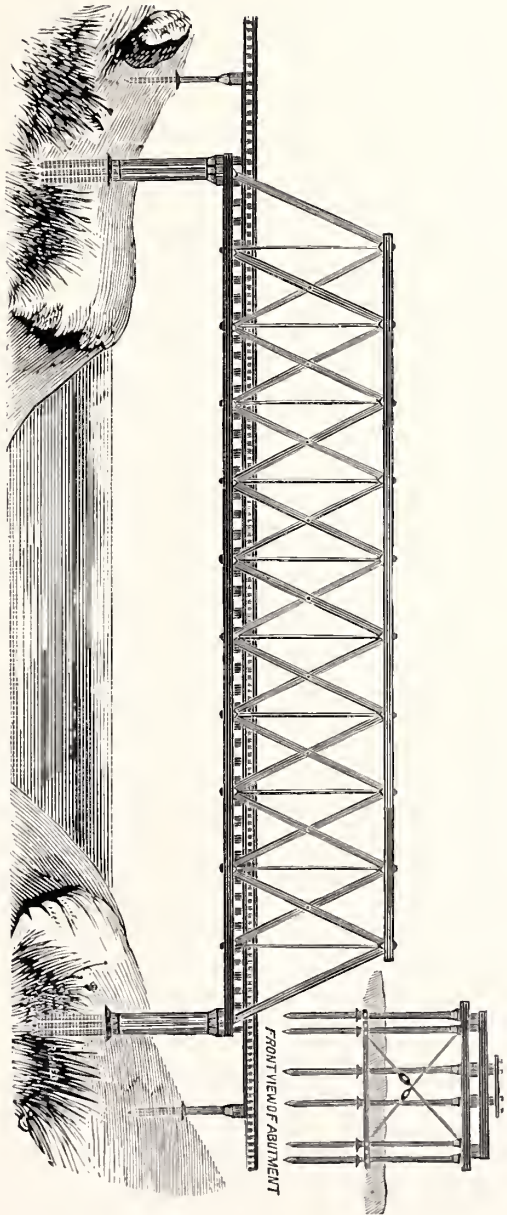
C. BUNTON,
Chief Engineer.

DWIGHT, ILL., February 27, 1884.

T. F. Harwood, Pres. Iron Pile & Bridge Co., Bloomington, Ill.

DEAR SIR — I have examined with much interest your plan for highway bridges, and have no doubt of its value as a means of actual economy, of course, mainly found in the durability and capability of iron compared with wood and any but first quality of stone. Your plan will be economical in the greater part of the

RAILROAD BRIDGE OVER WILLIS CREEK, GUERNSEY COUNTY, OHIO.



Gen. P. P. Case:

DEAR SIR—I have watched with interest, during the spring floods, the bridge built in this (Union) county, O., on your plan of iron substructure. The bridge was built in three spans, making two piers in the stream. These piers have withstood the recent unusually heavy ice with perfect satisfaction, and have not received the least injury. I consider them equal in every respect to stone piers, and in several points superior to stone. They furnish less surface to resist the floods, ice, and drifts, and at the water line, where stone is so liable to crumble when exposed to frost, they are not injured. In this bridge both piers were built in less than half the time it would have taken to start a foundation for one stone pier. We are also very much gratified to save the tax payers of the county several hundred dollars, and at the same time build as good and, I think, better and more durable bridge than would have been done with stone. Very respectfully yours, F. J. SAGER, C. E.

MARYSVILLE, UNION Co., O., April 24, 1885.

State and wherever the same scarcity of stone exists of a suitable character for constructing enduring abutments, piers and foundations.

Very respectfully yours,

RICHARD P. MORGAN, JR.,

Civil Engineer and Railway Expert.

COLUMBUS, O., January 10, 1884.

We, the undersigned Surveyors and Engineers, having examined the Gray-Abbott cast iron pile, designed for substructures, approve and commend the same as a desirable substitute for masonry and wood piling for country bridges, its principal advantages being durability, cheapness, and the ease with which it is erected.

B. F. BOWEN, COL. G. S. INNIS, JOHN GRAHAM, Columbus, Franklin County, O.

T. J. SAGER, Marysville, Union County, O.

JOHN HARVEY, Wilmington, Clinton County, O.

B. J. ASHLEY, Mt. Gilead, Morris County, O.

L. B. WISNARD, Norwalk, Huron County, O.

GEO. A. LATIMER, Medina, Medina County, O.

S. M. SEYMOUR, Eng'r Construction Ohio Central.

W. H. JENNINGS, Eng'r C. H. V. & T. R. R., H. V. Div., Columbus, O.

F. B. SHIELDON, " " " " " Toledo Div., " "

PHIL. D. FISHER, Chief Eng'r Col. & Cent'l Midland, " "

FRANK J. AID, " " Col. & Eastern, " "

Highway Commissioners, county and city officers, *tax-payers* and bridge contractors are invited to correspond with us. We shall be pleased at all times to quote prices, whether there is any intention of building a bridge or not, so that they may intelligently compare the cost of the different constructions. To enable us to make an intelligent estimate we need information upon the following points:

Number of spans and length of each span.

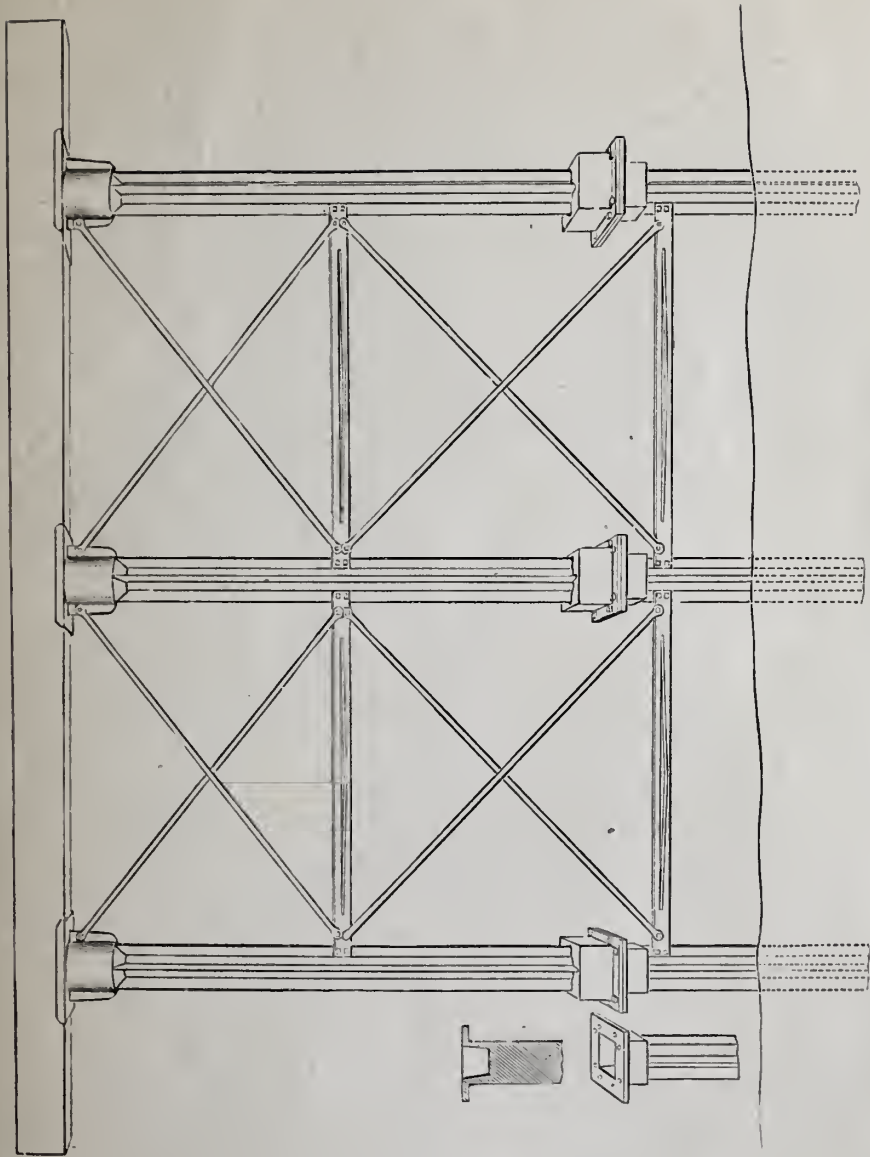
Width of roadway.

Height of road-bed above the bottom of stream.

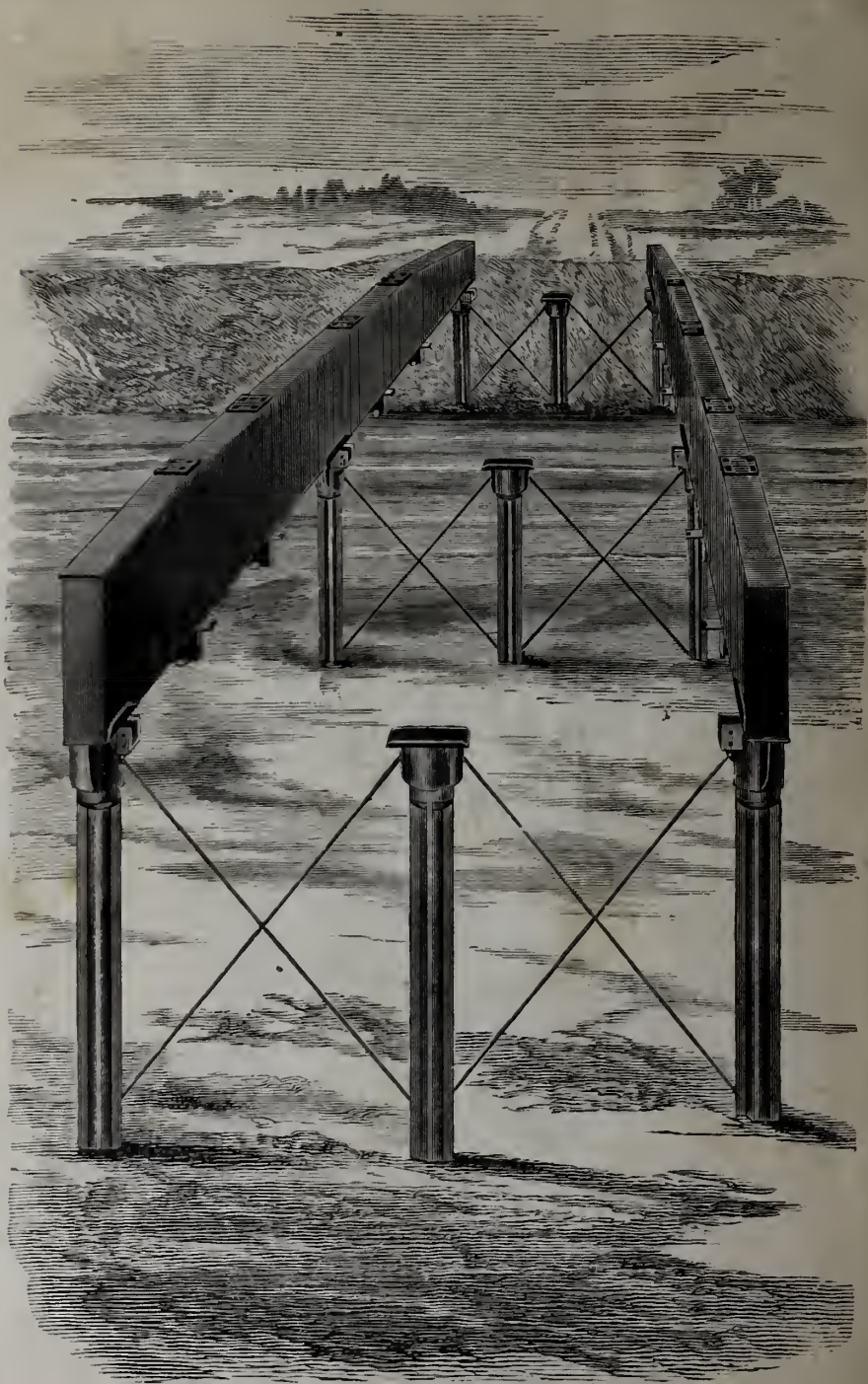
Length of pile required.

Kind of lumber to be used and its probable cost at the bridge site.

Name of nearest railroad station; also, strength of bridge required, if any particular strength has been determined upon; or whether the bridge is situated upon a country road, a well-balasted turnpike, or located in a city or village, or subject to heavy loads.



TRESTLE.



VIEW OF BRIDGE WITH ENTIRE FLOOR SYSTEM TAKEN OUT.